Practice Final

1 True/False

For each of the following questions respond true if the statement is true and false if the statement is false. If your response is false give a counter example or explain why.

1. The limit of a function exists at removable discontinuities.

2. $f(x) = \frac{x}{x-1}$ is continuous on $[-1, 2]$

3. Differentiable functions are continuous

4. The second derivative test can be used for any type of critical point that the first derivative test can be.

5. The derivative of the antiderivative of f(x) is equal to f(x).

6. If $\int_a^b f(x)dx = 0$ then f(x)=0 for all x between a and b.

7. To find the volume of the region bounded between $y = x^2$ and $y = x$ rotated about the x-axis you should use the method of disks.

8. In order to find the length of a curve described by an equation that is not a function you must first parametrize the equation.

2 Free response

1a. Find

$$\lim_{x \to -2} \frac{x^2 + 5x + 6}{x - 2}$$

1b. Find

$$\lim_{x \to 3} \frac{x^2 + 4x + 4}{x - 3}$$

2. Using the limit definition of the derivative find f'(x) if $f(x) = 2x$

3a. $D_x[x^2 \cos(x)]$

3b. $\frac{d}{dx}[\sin(\sqrt{(x)})]$

3c. $D_x[\frac{x+1}{x}]$

4. Using implicit differentiation solve for $\frac{dy}{dx}$ if $y^2 + y\sin(x) = 6x$

5. Using the derivative test of your choice find all local maxima and minima of $g(x)$ if $g'(x) = \frac{(x+2)^3(x-3)}{(x+2)^2}$

6. Find all regions of concave up/down if $h(x) = x^4 + 8x^3 - 18x^2 + 4x + 2$

7. Find the antiderivative of $x^3 - 2x + 4\sin x$

8. If $f(x) = \int_{x^2}^{3} (3t + 7)dt$ find $f'(x)$

9. Evaluate $\int_0^{\sqrt{x}} 4x \sin(x^2) dx$

10. Find the volume of the resulting solid of rotation when the region bounded by the curves $y = \frac{x^2}{\pi}$, x=4, y=0 is rotated about the x-axis.

11. Find the length of the curve of $y = \frac{2}{3}x^{3/2}$ between x=0 and x=4